TABLE A
MARSHALL MIX CRITERIA
MINIMUM LAB VOID CRITERIA BASED ON TRAFFIC VOLUMES

Marshall Design	75 Blow	75 or 50	50 Blow		
ADT	≥ 10,000	10,000 - 5,000	5,000 - 2,000	2,000 - 1,000	≤ 1,000
Surface Course	3.5%	3.5%	3.5%	3.0%	2.5%
Intermediate Course	3.5%	3.5%	3.0%	3.0%	2.5%
Base Course	3.5%	3.5%	3.0%	3.0%	2.5%
MP projects when no traffic data is provided		Type A	3.0%	Type B	2.5%
Shoulders placed as a separate operation					2.5%

Target laboratory voids for mix design and plant produced mix will be 0.5% above the values in Table A to allow for variances in the plant and testing repeatability.

The **maximum laboratory voids** allowed for plant produced mix will be the target value plus 1.00%.

The minimum and maximum laboratory voids determined above establish the “Working Range”.

TABLE B
MARSHALL MIX CRITERIA
TYPE A HOT MIX ASPHALT
LEVELING, INTERMEDIATE, AND SURFACE COURSES
Test Value Guides for Plant Produced Mixtures and Mix Design[7]

Size of Mixture		25.0 mm (1") Mix	19 mm (3/4") Mix	12.5 mm (1/2") Mix	9.5 mm (3/8") Mix
		Average Values for Laboratory Compacted Mix			
% Lab Air Voids[1],[2]	Minimum Target Maximum	Based on Traffic See Table A minimum value + 0.5% minimum value + 1.5%			
% VMA Minimum[1],[6]	50 Blow	10.0 + V_t	10.5 + V_t	11.0 + V_t	13.0 + V_t
Voids in Mineral Aggr.	75 Blow	9.0 + V_t	9.5 + V_t	10.0 + V_t	12.0 + V_t
Asphalt Binder Film Thickness wearing courses (microns)	Minimum	8.0	8.0	8.0	8.0
	Maximum	13.0	13.0	13.0	13.0
Asphalt Binder Film Thickness non-wearing courses (microns)	Minimum	7.5	7.5	7.5	7.5
	Maximum	13.0	13.0	13.0	13.0
Marshall Stability [in Newtons (lbf)]	Minimum	6700 (1500)	6700 (1500)	6700 (1500)	6700 (1500)
Filler/Bitumen Ratio[3] (Cold Feed)	Minimum	0.30	0.30	0.30	0.30
	Maximum	1.20	1.20	1.20	1.20
		Mix Compacted on Roadway			
% Lab Density[5]	Minimum	As Specified			
% Air Voids[1],[2],[4] Average	Minimum	4	4	4	4
	Maximum	8	8	8	8

NOTES:
1. Except when otherwise specified, mix proportions should be adjusted to exhibit test values in the ranges given. (50 blow and 75 blow Marshall mix design).
2. Extreme caution should be exercised when mixtures exhibit average values near the lower limits and ADT exceeds 3000 VPD (See Table A).
3. Filler bitumen is the ratio of material passing the 75 µm (#200) sieve divided by percent of asphalt in the mix.
4. Target lab voids prevail. Density may have to be increased to be within maximum field voids. See Supplemental Specification 01001. If conflicts develop between lab and field voids, see Table A.
5. Based on daily average Marshall densities from field laboratory.
6. V_t = Target % Lab Air Voids (minimum from Table A plus 0.5%)
7. Mix designs with test values outside the above ranges may be approved by the District Materials Engineer if the plant produced mix will meet these criteria.

TABLE C
MARSHALL MIX CRITERIA
TYPE B HOT MIX ASPHALT
LEVELING, INTERMEDIATE, AND SURFACE COURSES
Test Value Guides for Plant Produced Mixtures and Mix Design[7]

Size of Mixture		25.0 mm (1") Mix	19 mm (3/4") Mix	12.5 mm (1/2") Mix	9.5 mm (3/8") Mix
		Average Values for Laboratory Compacted Mix			
% Lab Air Voids[1],[2]	Minimum Target Maximum	Based on Traffic See Table A minimum value + 0.5% minimum value + 1.5%			
% VMA Minimum[1],[6] Voids in Mineral Aggr.	50 Blow	10.0 + V_t	10.5 + V_t	11.0 + V_t	13.0 + V_t
Asphalt Binder Film Thickness wearing courses (microns)	Minimum Maximum	8.0 13.0	8.0 13.0	8.0 13.0	8.0 13.0
Asphalt Binder Film Thickness non-wearing courses (microns)	Minimum Maximum	7.5 13.0	7.5 13.0	7.5 13.0	7.5 13.0
Marshall Stability [in Newtons (lbf)]	Minimum	5400 (1200)	5400 (1200)	5400 (1200)	5400 (1200)
Filler/Bitumen Ratio[3] (Cold Feed)	Minimum Maximum	0.30 1.20	0.30 1.20	0.30 1.20	0.30 1.20
		Mix Compacted on Roadway			
% Lab Density[5]	Minimum	As Specified			
% Air Voids[1],[2],[4] Average	Minimum Maximum	3 8	3 8	3 8	3 8

NOTES:
1. Except when otherwise specified, mix proportions should be adjusted to exhibit test values in the ranges given.
2. Extreme caution should be exercised when mixtures exhibit average values near the lower limits and ADT exceeds 2000 VPD (See Table A).
3. Filler bitumen is the ratio of material passing the 75µm (#200) sieve divided by percent of asphalt in the mix.
4. Target lab voids prevail. Density may have to be increased to be within maximum field voids. See Supplemental Specification 01001. If conflicts develop between lab and field voids, see Table A.
5. Based on daily average Marshall densities from field laboratory.
6. V_t = Target % Lab Air Voids (minimum from Table A plus 0.5%).
7. Mix designs with test values outside the above ranges may be approved by the District Materials Engineer if the plant produced mix will meet these criteria.

TABLE D
MARSHALL MIX CRITERIA
TYPE B HOT MIX ASPHALT
CLASS I AND II BASE COURSES
Test value Guides for Plant Produced Mixtures and Mix Design[7]

Size of Mixture		25.0 mm (1")	As Specified	
Class of Mixture		I & II	I	II
		Average Values for Laboratory Compacted Mix		
% Lab Air Voids[1],[2]	Minimum	Based on Traffic See Table A		
	Target	minimum value + 0.5%		
	Maximum	minimum value + 1.5%		
% VMA Minimum[1],[6]	50 Blow	10.0 + V_t	10.5 + V_t	10.5 + V_t
Voids in Mineral Aggr.	75 Blow	9.0 + V_t	---	---
Asphalt Binder Film Thickness				
wearing courses	Minimum	8.0	8.0	8.0
(microns)	Maximum	13.0	13.0	13.0
Asphalt Binder Film Thickness				
non-wearing courses	Minimum	7.5	7.5	7.5
(microns)	Maximum	13.0	13.0	13.0
Marshall Stability	Minimum	5400	5400	4500
[in Newtons (lbf)]		(1200)	(1200)	(1000)
Filler/Bitumen Ratio[3]	Minimum	0.30	0.30	0.30
(Cold Feed)	Maximum	1.20	1.20	1.20
		Mix Compacted on Roadway		
% Lab Density[5]	Minimum		As Specified	
% Air Voids[1],[2],[4]	Minimum	3	3	3
Average	Maximum	8	8	8

NOTES:
1. Except when otherwise specified, mix proportions should be adjusted to exhibit test values in the ranges given.
2. Extreme caution should be exercised when mixtures exhibit average values near the lower limits and ADT exceed 500 VPD (see Table A).
3. Filler bitumen is the ratio of material passing the 75µm (#200) sieve divided by percent of asphalt in the mix.
4. Target lab voids prevail. Density may have to be increased to comply with maximum field voids. See Supplemental Specification 01001. If conflicts develop between lab and field voids, see Table A.
5. Based on daily average Marshall densities from field laboratory.
6. V_t = Target % Lab Voids (minimum from Table A plus 0.5%).
7. Mix designs with test values outside the above ranges may be approved by the District Materials Engineer if the plant produced mix will meet these criteria.